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TIMBER LOSS ESTIMATES FOR THE CONIFEROUS FORESTS OF THE UNITED STATES DUE TO DWARF MISTLETOES

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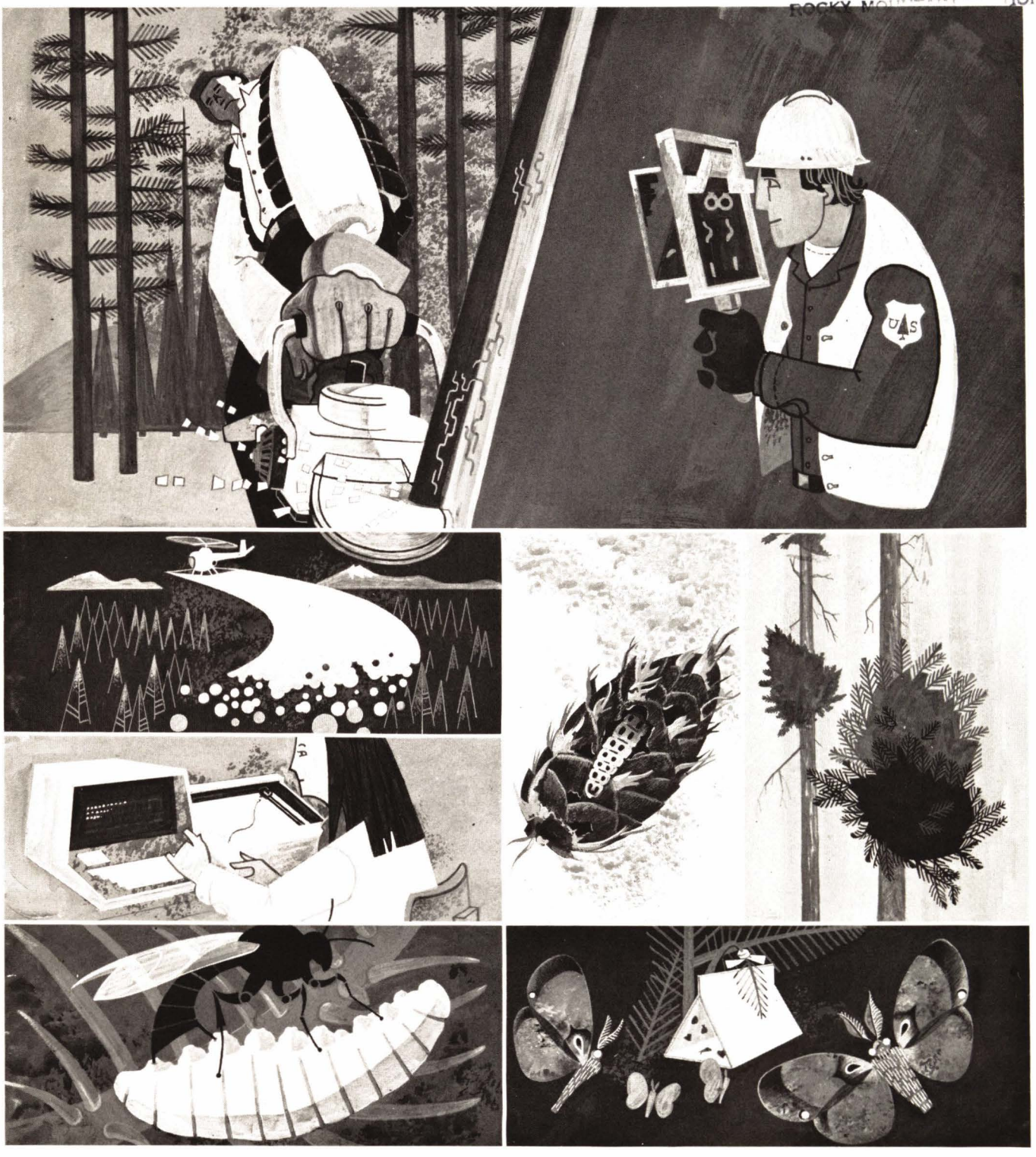

Report No. 83-2

3400
October 1982

TIMBER LOSS ESTIMATES FOR THE CONIFEROUS FORESTS OF THE UNITED STATES DUE TO DWARF MISTLETOES[1/]

Compiled by

David B. Drummond[2/]

ABSTRACT

The USDA Forest Service, Forest Pest Management staffs submitted Regional estimates of cubic-foot volume loss caused by dwarf mistletoes. These estimates, many of which have been recently updated, are compiled and summarized in this report. Total volume loss is estimated to be 417.84 million cubic feet per year for all regions.

INTRODUCTION

Dwarf mistletoes Arceuthobium spp. are parasitic plants which are regarded as the most damaging disease causing agents of western conifers. They adversely affect the growth, survival and reproductive potential of a number of commercially important tree species in the United States. This report presents the best assessment available to date of the current annual loss caused by the dwarf mistletoes to the coniferous forests of the United States.

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1 Thanks are due to Jerry Beatty (R-3), Oscar Dooling (R-1), Jim Hadfield (R-6), Frank Hawksworth (Rocky Mountain Forest and Range Experiment Station), Jim Hoffman (R-4), Dave Johnson (R-2), Tom Laurent (R-10), Robert Scharpf (PSW), Dick Smith (R-5), Jim Walters (NA), Ed Wood (R-3) and other members of the dwarf mistletoe working group for both their cooperation and the great deal of work involved in gathering data for and submitting these estimates.

2 Present position, Field Representative USDA Forest Service, Southeastern Area, Forest Pest Management, Pineville, LA. Formerly Plant Pathologist, USDA Forest Service, Forest Pest Management, Methods Application Group, Davis, CA.

METHODS

The losses reported herein are primarily due to Arceuthobium americanum on lodgepole pine, Pinus contorta; A. campylopodum on ponderosa pine P. ponderosa var. ponderosa and Jeffrey pine P. jeffreyi; A. douglasii on Douglas-fir Pseudotsuga menziesii; A. laricis on Western larch, Larix occidentalis; A. pusillum on Black spruce, Picea mariana; A. tsugense on western hemlock, Tsuga heterophylla; and A. vaginatum subsp. cryptopodum on Ponderosa pine, P. ponderosa Laws.

Volume losses reported are only for commercial forest lands. Most Forest Service regions over the past several years, have reduced the number of acres that are so classified, thus, there is a large amount of disease and general poor stand-health caused by dwarf mistletoe that is not considered in this estimate because it occurs in stands classified as non-commercial. Some regions have harvested trees from areas that were previously heavily infested. Although reproduction in these areas might be infected, the stands would not yet have reached a size class large enough to have incurred volume loss. These areas were also not considered. Because of a vigorous program of removing infected residual trees after harvest, many of these acres are now dwarf mistletoe-free.

Many of the estimates provided by the regions were made recently. These include lodgepole pine, Douglas-fir and western larch in Montana and, N Idaho, (Northern Region, R-1); lodgepole pine in Wyoming, and Colorado (Rocky Mountain Region, R-2) ponderosa pine in Arizona and New Mexico (Southwest Region, R-3); lodgepole pine in Utah, Idaho, Wyoming (Intermountain Region, R-4); and all species in California (Pacific Southwest Region, R-5).

The Rocky Mountain, Southwestern, Intermountain and Northern Regions all made use of the RMYLD yield prediction model (Edminster 1978) or the earlier SWYLD 2 model (Edminster and Hawksworth 1976) in generating at least part of their growth loss estimates. RMYLD considers the growth reduction and mortality caused by lodgepole pine and Southwestern ponderosa pine dwarf mistletoes in the prediction of growth and yield of these tree species.

The Northern and Intermountain Regions used a road-plot survey technique in conjunction with the RMYLD yield prediction model similar to the technique used in the Rocky Mountain Region (Johnson et al. 1978, 1979, 1980, 1981) for lodgepole pine. In addition, surveys in 1979 and 1980 of subcompartments in several National Forests of the Northern Region (Dooling and Eder, 1981) have resulted in an update of the Northern Regions estimates for Douglas-fir and western larch.

The Southwestern Region's loss estimate for ponderosa pine was derived by using data from stand examinations gathered over several years. These data were entered into the SWYLD2 projection model and later RMYLD to estimate expected volume production from stands. This was done by projecting the stand to rotation age using optimum management options available in the model relative to both timber production and mistletoe control. The volume potential of the same stands derived from a projection using the minimum management options were subtracted from these volume estimates. These options were often a decision to do nothing, or to thin without regard for the presence and intensity of dwarf mistletoe in the stand.

The Pacific Southwest Region used the Pest Damage Inventory system developed in that region to assess mortality. Based on the total amount of mortality for the two years reported, a portion of that mortality was attributed to dwarf mistletoe based on the proportion of dwarf mistletoe found implicated in the mortality during ground surveys.

Some estimates remain unchanged from those made in 1974 and used by Shea and Howard (1968). The Pacific Northwest Region (R-6) continues to use the 148 million cubic-foot per annum volume loss estimate originally put forth by Childs and Shea (1967) although they believe that this estimate may be as much as 1/3 too high. Personnel in this region are presently consulting various data sources with which they will update loss estimates for all species. Estimates for the Alaska Region (R-10) are also from Shea and Howard (1968).

RESULTS & DISCUSSION

Table 1 summarizes the data on dwarf mistletoe-caused losses submitted by the various regions. The estimated total volume loss is 417.84 million cubic feet per year. Annual volume loss estimates ranged from 11 million cubic feet for Alaska to 148 million cubic feet for Washington and Oregon combined. The two highest estimates of loss came from the major timber-producing regions and included Washington, Oregon and California. The loss of 20 cubic feet per acre per year by Douglas-fir and Western larch in the Northern Region and 21.7 cubic feet per acre per year for Douglas-fir in the Southwest Region from infested acreage represents the greatest volume loss on a per acre per year basis. It is interesting to note that the Northern and Southwestern Regions' estimates for Douglas-fir were determined independently and yet are very similar.

The total volume loss figure of 417.84 cubic feet is probably a conservative estimate. While estimates for Regions 1, 5, 6, 10 and NA are for all commercial ownerships, Regions 2, 3 and 4 reported volume losses for commercial National Forest land only. The Pacific Southwest Region reported losses to mortality and while they indicated that as a rule of thumb an equal amount is lost through growth loss, this is not included in the estimate shown in Table 1.

Estimates made using RMYLD are themselves conservative because they estimate loss for a 10 year period in the middle of a rotation for an infested stand. If such a stand had not been infested to begin with, the starting parameter values used to make the estimate would have been greater and, as a result, the added increment would also be greater for the 10 year period. Thus, the cumulative effects of infection, i.e., the reduction in growth rates, are not fully reflected in the estimates.

Using RMYLD (Edminster 1978) in the Northern region has resulted in a lowering of the loss per-acre per-year estimate for the lodgepole pine type. The Northern region has also lowered its volume loss estimate for the Douglas-fir and western larch growing areas of the state as a result of more recent surveys (Shea and Howard 1968). In other Forest Service regions recently acquired estimates were close to previous estimates.

TABLE 1 - Loss Caused by Dwarfmistletoes by Host Tree and Region [1/]

Region	Species	Commercial Host Type (M Acres)	Area Infested (M Acres)	% of Area Infested	Annual Loss per acre (ft^3)	Total Loss (MCF) [2/]
Montana, N N Idaho (R-1; All lands)	Lodgepole pine	5,931	1,705	29	9.3 - 12.1	18,210
	Douglas-fir	4,962	657	13	20.0	13,150
	Western larch	2,034	766	38	20.0	15,320
	All Species	12,927	3,128	-	-	46,680
Colorado, E Wyoming (R-2; NF Only)	Lodgepole pine	1,799	879	51	-	9,560
	Ponderosa pine	720	-	-	-	8,700
	All Species	2,519	-	-	-	18,260
Arizona, New Mexico (R-3; NF Only)	Ponderosa pine	7,010	2,500	36	7.5	18,750
	Douglas-fir	550	270	50	21.7	5,870
	All Species	7,560	2,770	-	-	24,750
S Idaho, Utah Nevada, W Wyoming (R-4, NF Only)	Lodgepole pine	2,420	1,420	59	12.3	17,490
	Ponderosa pine	1,080	270	26	-	1,690
	Douglas-fir	3,010	910	30	-	16,680
	All Species	6,510	2,600	-	-	35,860
California (R-5; All lands)	Ponderosa	-	-	-	-	
	Jeffery &	-	-	-	-	
	Lodgeole pines	-	-	-	-	
	Douglas-fir	-	-	-	-	
	White-fir	13,570	2,810	21	9.0	122,130
Oregon, Washington (R-6; All lands)	Ponderosa &	-	-	-	-	
	Lodgepole pines	-	-	-	-	
	Douglas-fir	-	-	-	-	
	Western larch	-	-	-	-	
	Hemlock	36,140	8,460	23	-	148,000
Alaska (R-10, All lands)	Western hemlock	-	-	-	-	11,000
	Black Spruce	-	-	-	-	
Michigan, Minnesota, Wisconsin, (NA, All lands)	Black Spruce	2,070	280	14	-	11,160
Total						417,840

[1/] These data were compiled from existing records, special surveys and resource inventories.

[2/] Includes growth reduction and tree mortality.

The estimate for the Pacific Southwest Region was expanded using Forest Survey data for commercial acreage. It was assumed that the long term cubic-foot volume loss fell much closer to the 1977 estimate of 60.1 million cubic feet on National Forest land than the estimate of 327.34 million cubic feet which occurred immediately after a severe drought. Their initial estimate, based on National Forest land, indicated that 9 cubic feet were lost per acre per year. Bolsinger's summary of Forest Survey data indicated that there was a total of 13.5 million acres of commercial timberland in California of all ownerships. This total acreage figure was used for the Pacific Southwest Regions total volume loss estimate instead of the value for just the National Forests.

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APPENDIX: REGIONAL SUMMARIES

Regional summaries, generally in a tabular format, and any pertinent narrative submitted by the various regions are presented in this appendix.

The Northern Region

Tables 1, 2, and 3 were submitted by the Northern Region Forest Pest Management unit. The estimates for lodgepole pine were derived using a road-plot survey and the RMYLD yield projection program. Additionally, surveys in 1979 and 1980 of subcompartments in several National Forests (Dooling and Eder, 1981) has resulted in an update of the Region's original estimates for Douglas-fir and Western larch.

Rocky Mountain Region

The Rocky Mountain Region Forest Pest Management unit submitted Tables 4 and 5 containing estimated cubic-foot volume loss to lodgepole and ponderosa pine by dwarf mistletoes on National Forests within the Region. The data for lodgepole pine has been published recently in Plant Disease (Johnson et al. 1981). The narrative below was extracted from the Region's accompanying letter:

> We have prepared an estimate of annual dwarf mistletoe-caused loss in Region 2 for lodgepole and ponderosa pine (Tables 4 and 5). Acres of pole- and sawtimber-size trees were obtained from our most recent timber management plans. The estimate of loss of 18.2 million cubic feet annually only includes commercial timber species on commercial and deferred National Forest land. Estimates of loss for Wyoming forests were derived from survey data collected in 1977 and 1978 (Johnson et al. 1978, 1979). Data for Colorado Forests were gathered during 1979 (Johnson et al. 1980). These surveys were part of a pilot project to obtain better loss estimates for lodgepole pine dwarf mistletoe.
>
> It is interesting to note that an estimate of dwarf mistletoe-caused loss made in 1966 by Dr. Frank Hawksworth for lodgepole pine and ponderosa pine for Colorado and Wyoming was 76 million cubic feet annually. The discrepancy between our estimate and this earlier estimate is primarily due to the difference in commercial forest land acreage used to compute loss. The older figure (1966) included lands of all ownership (7,209,000 acres). There also have been reductions in commercial
>
> National Forest acreage due to increases in wilderness. The older estimate included acres of seedlings and saplings. Since dwarf mistletoe has no measurable effect on volume on very young stands, acres of this size class were excluded.

The Southwest Region

The Southwest Region's estimate for ponderosa pine (Table 6) was derived from past runs of SWYLD (Edminster 1976)(now a part of RMYLD) and RYMLD (Edminster 1978). The loss represented the difference between alternative management options for the stands tested. The options depicted growth if little or no management was exercised, and growth if the best management option was used. The latter case assumed mistletoe control strategies were followed. The differences in growth between the two options in infestd stands were assumed to be the result of growth reduction and mortality caused by dwarf mistletoe. The following is a quote from the Region 3 accompanying letter:

> Ponderosa pine is by far the most important commercial timber species in Region 3. As a result, almost all the dwarf mistletoe surveys for the last five years have been restricted to this timber type. The data obtained from these surveys are the most accurate and trustworthy available for mistletoe in the Region. In estimating annual volume losses, 42 surveys from 10 National Forests were used in a simulated yield computer program (RMYLD, Edminster 1978) under both "good" and "bad" dwarf mistletoe management practices. The volume yield differences between the good and bad management alternatives were then adjusted to an annual basis and then projected for the total acreage infected.
>
> Estimates for Douglas-fir volume losses are also included, based on data from an earlier survey. This estimate has neither the reliability nor the importance of the estimate provided for ponderosa pine.

The Intermountain Region

Table 7 summarizes data gathered for lodgepole pine in Region 4. Some of the data in Table 7 were presented in 1979 by Hoffman and Hobbs and have recently been updated by Hoffman (personal communication, 1981).

The Pacific Southwest Region

The following narrative and data were submitted by Region 5 Forest Pest Management unit. In the narrative, they present an explanation of the loss associated with the 1976-78 drought years. The data are presented in Tables 8, 9, and 10.

> In response to the W.O. request for an estimate of annual dwarf mistletoe losses which occur in the California Region, FPM R-5 has arranged its answers into the following three sections: 1) The data base from which the estimates were made; 2) The estimates of losses and assumptions made in obtaining the estimates and; 3) A narrative about concerns and complicating factors.

The Northeastern Area

The Northeastern Area has one dwarf mistletoe species, Arceuthobium pucillium which occurs on black spruce. The estimate submitted by the Northeastern Area deal only with losses occurring in the States of Minnesota, Michigan, and Wisconsin.

Data Base

We have data on mortality losses caused by dwarf mistletoes for the two years, 1976-1978 on commercial forest in National Forest lands. Table 8 shows the estimated cubic foot loss due to dwarf mistletoe caused mortality during the year from May 1976 to May 1977. These loss estimates are based on three separate surveys which together covered 95-97% of the commercial forest land in the National Forests of California. Extrapolation to all commercial forest lands in the National Forests of California yields an estimated loss for this one year period of 60,096 M cubic feet.

In Table 9, we have presented the 1976-77 mortality loss estimates for the major host species in the National Forests of California. Again, these estimates are based on the three surveys covering 95-97% of commercial Forest Service land within Region 5. The hard pines (ponderosa and Jeffrey) experienced the greatest mortality due to dwarf mistletoe.

The June 1977 to June 1978, dwarf mistletoe caused mortality is presented in Table 10. These estimates were based on two surveys of 6,451 M acres of commercial Forest Service land in California. Estimates for the Cleveland N.F. were made assuming no change in mortality rate and using the estimates from the previous year's (76-77) survey. During this drought year, dwarf mistletoe mortality loss in the commercial forest lands of the National Forests of Region 5 increased to 327,335.8 M cubic feet.

Statewide Estimates and Assumptions

Previous insect and disease loss estimates indicate that the total 1976-77 insect and diseae losses were about twice normal. Assuming that 1976-77 represents a year of about twice normal mortality, and that during normal years volume losses from dwarf mistletoe mortality and dwarf mistletoe growth loss are roughly equal, we estimate growth loss due to dwarf mistletoe on Forest Service commercial forest land to be about 30,000 MCF. Furthermore, we would expect this growth loss to be relatively constant from year to year and not fluctuate as does mortality loss.

The acreages of State and Private commercial land is slightly greater than Forest Service land. The types are not too dissimilar and ownership is often mixed. We, therefore, make

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The acreages of State and Private commercial land is slightly greater than Forest Service land. The types are not too dissimilar and ownership is often mixed. We, therefore, make the assumption that they have the same dwarf mistletoe problems and are suffering from similar losses. With these assumptions, we estimate the total losses due to dwarf mistletoe on commercial forest land of all ownerships in the California Region in each of the last two years to be as follows:

May 1976 - May 1977

Mortality loss	120,000 MCF
Growth loss	60,000 MCF
Total loss	180,000 MCF

June 1977 - June 1978

Mortality loss	654,700 MCF
Growth loss	60,000 MCF
Total loss	714,700 MCF

Concern and Comments

Dwarf mistletoe mortality-related losses can and do vary greatly from year to year. The concept of "the annual loss" is misleading in that it leads one to expect near constant loss from year to year. To be more specific and correct, we should talk of the "average annual loss" which would be computed from several years' estimates. For example, we have estimated yearly losses of 180 and 714 million cubic feet both of which we believe to be above normal, or average, due to the unusual drought the California Region experienced. With the return of normal rainfall, we fully expect to enter a period of below normal dwarf mistletoe caused mortality. Thus, an average estimate of loss can only be computed after several years of data collection and experience.

Secondly, we wish to emphasize the fact that the mortality here reported as due to the dwarf mistletoe does not include all mortality associated with dwarf mistletoe. In about an equal amount of mortality, as reported here, dwarf mistletoe was considered to be a significant factor in causing the mortality but not the primary cause. For example, when moderately to severely infected trees were attacked by bark beetles, 50% of the time bark beetles were considered to be the major cause of mortality and the loss was tabulated as bark beetle caused loss.

Lastly, FPM and the California Department of Forestry are cooperating on a survey of tree mortality on 6.5 million acres of state and private commercial forest land in Northern California. To date, FPM has photographed and interpreted the mortality on photo plots, and now the State is in the process of doing the second-stage ground survey. When this survey is finished, we should have a better estimate of dwarf mistletoe caused mortality loss on state and private lands of the California Region.

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TABLE 1: Estimate of annual and five year cubic foot volume loss due to dwarf mistletoe for three tree species in Northern Idaho

Douglas-fir dwarf mistletoe

Land Ownership	M Acres Comm Type	% In-fest	M Acres Infest.	Growth Reduction Ft^3/ ac/yr	Annual M/Ft^3	Last 5 years M Ft^3
National Forest	1,102.0	10	110.2	20	2,204.0	11,020.0
Other Federal	66.3	10	6.6	20	132.0	660.0
Industrial Private	196.0	10	19.6	20	392.0	1,960.0
Non-Industrial Private	572.2	10	57.2	20	1,144.0	5,720.0
State/County/Municipal	193.7	10	19.4	20	388.0	1,940.0
TOTAL	2,130.2	--	213.0	--	4,260.0	21,300.0

Western larch dwarf mistletoe

National Forest	559.1	50	279.6	20	5,592.0	27,960.0
Other Federal	6.5	50	3.2	20	64.0	320.0
Industrial Private	29.2	50	14.6	20	292.0	1,460.0
Non-Industrial Private	178.4	50	89.2	20	1,784.0	8,920.0
State/County/Municipal	18.9	50	9.4	20	188.0	940.0
TOTAL	792.1	--	396.0	--	7,920.0	39,600.0

Lodgepole pine dwarf mistletoe

National Forest	882.7	10	88.3	12	1,059.6	5,298.0
Other Federal	4.2	10	0.4	12	4.8	24.0
Industrial Private	6.0	10	0.6	12	7.2	36.0
Non-Industrial Private	132.3	10	13.2	12	158.4	792.0
State/County/Municipal	12.3	10	1.2	12	14.4	72.0
TOTAL	1,037.5	--	103.7	--	1,244.4	6,222.0

Revised 12/16/81

TABLE 2: Estimate of annual and five-year cubic foot volume loss due to dwarf mistletoe for Lodgepole pine in Montana

Lodgepole Pine East of the Continental Divide

Land Ownership	M Acres Comm Type	% In-fest	M Acres Infest.	Growth Reduction (II) Ft^3/ ac/yr	Annual M/Ft^3	Last 5 years $M\ Ft^3$
National Forest	1 712.5	40.2	688.4	9.3	6,402.1	32,010.5
Other Federal	105.7	40.2	42.5	9.3	395.2	1,976.0
Industrial Private	2.0	40.2	0.8	9.3	7.4	37.0
Non-Industrial Private	306.5	40.2	123.2	9.3	1,145.8	5,729.0
State/County/Municipal	16.1	40.2	6.5	9.3	60.4	302.0
TOTAL	2,142.8	--	861.4	--	8,010.0	40,054.5

Lodgepole Pine West of the Continental Divide

National Forest	2,109.2	26.9	567.4	12.1	6,865.5	34,327.5
Other Federal	101.5	26.9	27.3	12.1	330.3	1,651.5
Industrial Private	106.7	26.9	28.7	12.1	347.3	1,736.5
Non-Industrial Private	348.8	26.9	93.8	12.1	1,135.0	5,675.0
State/County/Municipal	84.4	26.9	22.7	12.1	274.7	1,373.5
TOTAL	2,750.6	--	739.9	--	8,952.8	44,764.0

Lodgepole Pine Statewide

National Forest	--	--	1,255.8	--	13,267.6	66,338.0
Other Federal	--	--	69.8	--	725.4	3,627.5
Industrial Private	--	--	29.5	--	354.7	1,773.5
Non-Industrial Private	--	--	217.0	--	2,280.8	11,404.0
State/County/Municipal	--	--	29.2	--	335.1	1,675.5
TOTAL	--	--	1,601.3	--	16,963.7	84,818.5

Revised 12/16/81

TABLE 3: Estimate of annual and five-year cubic foot volume loss due to dwarf mistletoe for Douglas-fir and Western larch in Montana

Douglas-fir dwarf mistletoe

Land Ownership	M Acres Comm Type	% In-fest	M Acres Infest.	Growth Reduction Ft^3/ ac/yr	Growth Reduction Annual M/Ft^3	Growth Reduction Last 5 years M Ft^3
National Forest	1,573.7	15.7	247.1	20	4,942.0	24,710.0
Other Federal	192.5	15.7	30.2	20	604.0	3,020.0
Industrial Private	283.1	15.7	44.4	20	888.0	4,440.0
Non-Industrial Private	621.9	15.7	97.6	20	1,952.0	9,760.0
State/County/Municipal	160.1	15.7	25.1	20	502.0	2,510.0
TOTAL	2,831.3	--	444.4	--	8,888.0	44,440.0

Western larch dwarf mistletoe

National Forest	641.1	29.8	191.0	20	3,820.0	19,100.0
Other Federal	75.7	29.8	22.6	20	452.0	2,260.0
Industrial Private	172.0	29.8	51.2	20	1,024.0	5,120.0
Non-Industrial Private	289.9	29.8	86.4	20	1,728.0	8,640.0
State/County/Municipal	62.9	29.8	18.7	20	374.0	1,870.0
TOTAL	1,241.6	--	369.9	--	7,398.0	36,990.0

Table 4. Estimate of annual cubic foot volume loss of lodgepole pine due to Arceuthobium americanum for National Forests in The Rocky Mountain Region.

National Forest	Area of Commercial lodgepole pine type (M Ac)[1]	Area of type infested (M Ac)[2]	Annual Merchantable volume loss cu. ft/Ac[3]	Annual Merchantable volume loss Total (M cu. ft.)[4]
Colorado				
Arapaho and Roosevelt	458.6	220.9	10.8	2398.6
Grand Mesa, Uncompahgre and Gunnison	147.8	77.3	5.9	459.1
Pike and San Isabel	177.2	76.6	8.6	656.4
Rio Grande	6.2	0.0	0.0	0.0
Routt	173.2	90.7	11.7	1057.4
White River	147.0	52.1	0.6	31.2
subtotal	1,110.0	517.6	----	4602.7
Wyoming				
Bighorn	248.6	90.2	7.9	714.7
Medicine Bow	305.4	184.6	19.5	3599.3
Shoshone	135.4	86.7	7.4	643.8
subtotal	689.4	361.5	----	4957.8
Totals	1799.4	879.1	----	9560.5

1 From timber management plans, includes pole- and sawtimber stands only.

2 From surveys (1977-79).

3 Volume loss/ac infested.

4 From RMYLD calculations.

Table 5. Estimate of annual cubic foot volume loss of ponderosa pine to Arceuthobium vaginatum subsp. cryptopodum for National Forests in the Rocky Mountain Region.

Forest and Date of TM Plan	Thousands of acres and type*1			Annual cubic foot volume loss		
	Poles	Sawtimber	Total	Poles	Sawtimber	Total
Arapaho and Roosevelt (1975-76)	15.0	102.8	117.8	180,000	1,233,600	1,413,600
Grand Mesa-Uncompahgre and Gunnison (1975)	7.0	70.0	77.0	84,000	840,000	924,000
Pike and San Isabel (1962)	42.0	295.0	337.0	504,000	3,540,000	4,044,000
San Juan (1976)	0	191.0	191.0	0	2,292,000	2,292,000
Totals	64.0	658.8	722.8	768,000	7,905,600	8,673,600

*1 Includes only acres of pole- and sawtimber-size trees (5.0 dbh and larger) on commercial National Forest lands. Data source-Timber Management Plans.

Table 6. Ponderosa Pine. 1978 Dwarf Mistletoe Loss Assessment. Southwestern Region

Stand Name	Acres	% Inf.	10-year loss/stand mer. cu. ft.	1-year loss/stand mer. cu. ft.	1-year loss/acre mer. cu. ft.
Blue Ridge	117	5	1,053	105	.90
Palomas	142	27	54,492	5,449	38
Circle Bar A	482	35	103,027	10,302	21
Yellowjacket	171	35	34,542	3,454	20
Tusayan #1	525	18	78,312	7,831	15
Tusayan #2	736	20	54,865	5,487	7
Sheep Corral	445	26	176,092	17,609	40
Campground #4	691	5	14,511	1,451	2
Campground #3	1,357	22	160,126	16,013	12
Campground #2	442	1	24,752	2,475	6
Archuleta	652	33	68,460	6,846	11
Antelope #5	589	16	35,929	3,593	6
Antelope #6	602	7	50,166	5,017	8
Fluted Rock	2,586	4	186,192	18,619	7
Elk Springs	1,024	8	35,864	3,586	4
Tentground	416	3	53,248	5,325	13
Rivera	627	28	22,572	2,257	4
Colter #1	670	32	19,430	1,943	3
Colter #2	600	10	48,000	4,800	8
Long Draw #1	480	24	13,920	1,392	3
Long Draw #2	240	7	17,600	1,760	7
Pinto	660	10	13,860	1,386	2
Vallecitos	520	2	23,636	2,364	5
Jam	510	12	85,850	8,585	17
Reudd	150	45	27,375	2,738	18
Copperton	680	8	126,727	12,628	19
North Saddle #1	960	6	8,000	800	.83
Williams #2	270	12	23,100	2,310	9
Williams #3	480	1	13,333	1,333	3
Cerro Pelado	930	37	27,900	2,790	3
Horsetrap	640	5	16,640	1,664	3
Miller Block C	160	11	960	96	.60
Nick's Camp	1,750	3	80,500	8,050	5
Upper Elk	1,100	11	79,200	7,920	7
Compartment 317	920	32	25,760	2,576	3
Compartment 318	570	41	14,250	1,425	3
Compartment 319	850	48	39,950	3,995	5
Compartment 320	350	45	5,833	583	2
Vegitas 1	709	39	67,355	6,735	9
Vegitas 2	570	28	32,299	3,230	6
Pinabetosa	1,000	17	80,000	8,000	8
Rim Sale	1,100	25	101,750	10,175	9
Average		19	51,129	5,112	7.5
TOTAL	28,473		2,147,431	214,697	

Region 3 estimate continued on next page.

Table 7. Estimate of annual cubic foot volume loss of lodgepole pine due to Arceuthobium americanum for National Forests in the Intermountain Region

National Forest	Acres (M) of Host Type[1/]	Infected Acres (M) of Lodgepole Pine Number	Infected Acres (M) of Lodgepole Pine Percent	Annual Growth Loss Volume (ft^3 infested acre/year)	Total Growth Loss Volume (M ft /year)
Idaho					
Boise	176.0	82.8	47	14.25	1,180.0
Caribou	157.2	107.6	68	10.37	1,115.6
Challis	216.9	98.6	45	10.55	1,040.2
Payette	171.8	85.9	50	15.33	1,316.9
Salmon	283.0	166.4	59	18.35	3,054.7
Sawtooth	26.4	18.8	71	30.18	567.4
Targhee	491.5	388.3	79	9.08	3,525.8
	1,522.8	948.4	62	12.44	11,800.6
Nevada					
Toiyabe	37.0	6	17	--	--
Utah					
Ashley	248.0	144.0	58	13.00	1,872.1
Dixie	0.0	N/A	N/A	N/A	N/A
Fishlake	0.0	N/A	N/A	N/A	N/A
Manti-LaSal	0.0	N/A	N/A	N/A	N/A
Uinta	--	N/A	N/A	N/A	N/A
Wasatch	185.6	63.2	34	11.29	713.5
	433.6	207.2	46	12.36	2,585.6
Wyoming					
Bridger-Teton	362.0	241.6	67	11.80	2,850.9
	2,355.4	1,403.2	59	12.27	17,237.1

1/ Estimates of commercial acreage from recent timber management plans.
-- Insufficient data
N/A Not Applicable

Table 8. Dwarf mistletoe mortality loss on National Forests of California from May 1976 to May 1977.

Area	M acres within Survey Area	M cu. ft. Mortality Loss in Survey Area	Cu. ft. Mortality loss/acre in Survey Area	M Acres not in Survey But in Area	M cu. ft. Mortality Loss in Areas not Surveyed	M cu. ft. Total Mortality Loss for Area
Northern California	6,332	58,270	9.20	190.4	1,751.7	60,021.7
Southern California	119	28.3	0.24	31.3	7.5	35.8
Cleveland N.F.	7.1	23	3.24	4.8	15.6	38.6
Total California	6,458.1	58,321.3	9.03	226.5	1,774.8	60,096.1

Total National Forest acreage is 6,684.6 M acres, of which 6,458.1, or 97 percent, was included in surveys this year.

Table 9. Dwarf mistletoe mortality loss by major host species on the National Forests of California, May 1976-May 1977.

Area and Acreage CFL[1]	All Species		Ponderosa and Jeffrey Pines		White fir		Red fir		Sugar Pine	
	%	M cu. ft.	%	M cu. ft.	%	M cu. ft.	%	M cu. ft.	%	M cu. ft.
Northern California 6,522 M Acres		60,022	51	30,611	27	16,206	7	4,202	15	9,003
Southern California 150.3 M Acres		35.8	100	35.8[2]		0		0		0
Cleveland N.F. 11.9 M Acres		38.6	100	38.6[2]		0		0		0
Total California[3] 6,684.2 M Acres		60,096.4		30,685.4		16,206		4,202		9,003

1 CLF = Commercial Forest Land

2 Includes some Coulter Pine in with ponderosa and Jeffrey estimate.

3 Estimates based on 1977 surveys of 97 percent of Commercial Typed Forest Service Land.

Table 10. Dwarf mistletoe mortality loss on National Forests of California from June 1977 to June 1978[1].

Area	M acres within Survey Area	M cu. ft. Mortality Loss in Survey Area	Cu. ft. Mortality loss/acre in Survey Area	M Acres not in Survey But in Area	M cu. ft. Mortality Loss in Areas not Surveyed	M cu. ft. Total Mortality Loss for Area
Northern California	6,332	317,711	50.18	190.4	9,554	327,269
Southern California	119	22.3	0.19	31.3	5.9	28.2
Cleveland N.F.			3.24	11.9		38.6[2]
Total California	6,451	317,733.3		233.6		327,335.8

1 Estimates for 6,684.6 M Acres of commercial forest land.

2 Loss estimates from previous year used assuming little or no change in mortality rate occurred.

Table 11. Annual cubic-foot volume loss due to dwarf mistletoe in black spruce. Northeastern Area.

	Minnesota	Michigan	Wisconsin
Total acres of commercial black spruce type	1,407,700	428,100	235,900
N.F. commercial black spruce acres	256,600	51,000	66,400
Other commercial black spruce acres	1,151,100	377,100	169,500
N.F. infected black spruce acres	28,808	9,792	16,332
Other infected black spruce acres	126,621	64,107	37,290
Total growing stock, vol. cu. ft.	763,709,000	271,100,000	36,900,000
N.F. growing stock, vol. cu. ft.	137,467,620	32,260,900	10,332,000
Other growing stock, vol. cu. ft.	626,241,380	233,839,100	26,568,000
Infected N.F. growing stock vol. cu. ft.	15,396,373	6,194,093	2,541,672
Infected other growing stock vol cu. ft.	68,886,552	40,602,647	5,844,960
Annual N.F. vol. loss-- cu. ft.	1,231,710	495,527	203,334
Annual other vol. loss-- cu. ft.	5,510,924	3,248,212	467,597
Total annual vol. loss-- cu. ft.	6,742,634	3,743,739	607,931
Total Annual Vol. Loss All States (cu. ft.)		11,157,304	

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